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Report Highlights:

India's bio-fuel industry is in its nascent stage and evolving. The government's policy is focused on promoting the use of non-food sources for production of bio-fuels: sugar molasses for production of ethanol for blending with gasoline, and non-edible oilseeds for production of bio-diesel for blending with petro-diesel. While the government's current policy target of five percent blending of ethanol with petrol has been partially achieved, five percent blending of bio-diesel with petro-diesel has not started as production of bio-diesel is not significant.

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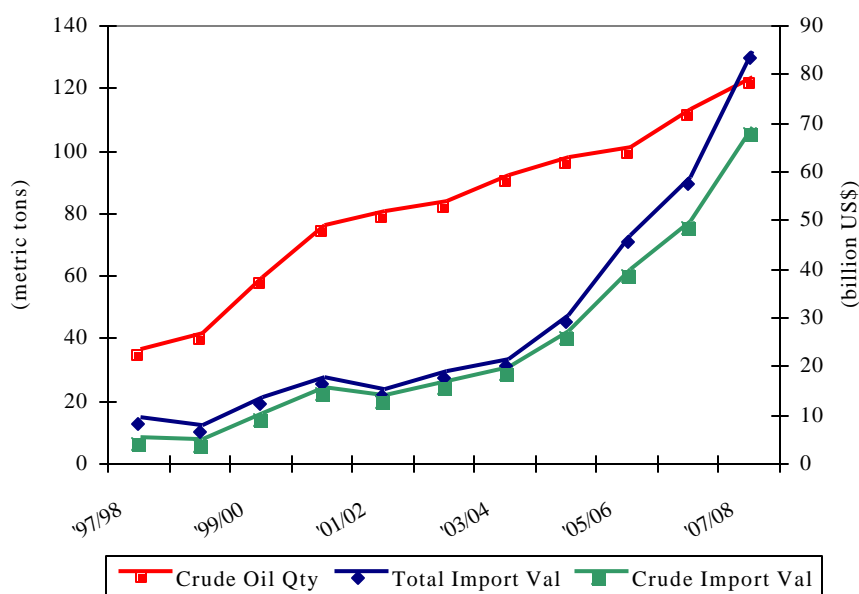
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BIO-FUELS POLICY OVERVIEW

Why Bio-fuels?

With a rapidly growing economy¹, rising population², and an expanding number of middle-class consumers, India is the sixth largest and one of the fastest growing energy consumers in the world. With limited domestic crude oil reserves, India meets over 72 percent of its crude oil and petroleum products (diesel, aviation fuel, etc.) requirement through imports, which are expected to expand further in coming years. Due to the escalation in global crude prices, India's oil import expenditure has quadrupled in the last four years.

Fig 1: India's Import of Crude Oil & Petroleum Products
(Quantity in million metric tons & Value in billion US\$)



Because of the continued escalation in global oil prices and growth in domestic consumption of petroleum products, the consequent ballooning expenditure on oil imports is a serious concern to the Government of India (GOI). The GOI is looking at ways to contain rising oil imports by promoting use of bio-fuels. Other factors driving the development of bio-fuel as an alternative source of energy are:

- Efforts towards self-reliance and developing renewable energy options vis-à-vis fossil fuels, the cornerstone of India's energy security strategy
- Adoption of environment friendly fuels that will help India adopt more environment friendly emission norms
- Support farmers by developing an alternative usage for sugarcane and byproducts
- Improve utilization of wastelands and other unproductive land for cultivation of bio-fuel feed stocks
- Enhance rural employment and livelihood opportunities

Given India's rising domestic demand for food, stagnating agricultural productivity, and limited scope for expansion in area under crop cultivation, food security is a national priority.

¹ In recent years, economy has grown between 7-9 percent per annum.

² India is world's second largest populous nation, with population growing at 1.8 percent per annum.

Consequently, the GOI does not afford to allow/promote the use of cereal grains for ethanol production or edible oils for bio-diesel production as is done in other bio-fuel producing countries. India is one of the leading importers of vegetable oil in the world as growing demand from Indian consumers outstrips domestic production. Furthermore, production of grains like wheat, corn and coarse cereals has been relatively stagnant in recent years raising concerns about impending food scarcity. Recent rising global prices for food has been a major concern for the government, which does not want to further aggravate the crisis by promoting the use of food commodities for bio-fuels in the country.

India's evolving strategy for promoting bio-fuel is two pronged:

- Promote the use of ethanol derived from sugar byproducts of molasses/juice for blending with gasoline
- Promote the use of biodiesel derived from non-edible oils for blending with diesel

India is one of the world's leading producers of sugarcane and sugar. Sugar molasses, a byproduct of the sugar industry is used for production of most of the rectified spirits (alcohol) produced in India, including ethanol for fuel. Bio-diesel production efforts are focused on using non-edible oils from plants (*Jatropha curcas*, *Pongamia pinnata* and other tree borne oilseeds) and animal fats like fish oil. Nevertheless, the GOI does not want the target bio-fuel feedstock crops to compete with food crops for scarce agricultural land. The focus is to encourage the use of wastelands and other unproductive land for the cultivation of these relatively hardy 'new' bio-fuel crops. An estimated 55.3 million hectares are considered wasteland³ in India, which could be brought into productive use by raising bio-diesel crops. The GOI thinking is also driven by the fact that bio-fuel crop cultivation in wastelands would provide additional employment to the vast rural population in India. There is some question as to the definition of 'wastelands' as some grazing or less intensive dry land farming may be taking place on these 'wastelands'. Nevertheless, bio-diesel production from non-edible oilseeds, etc. is still in the research and development stage in India.

Ethanol Policy

First Phase: The commercial production and marketing of ethanol-blended gasoline started in January 2003, when the Ministry of Petroleum and Natural Gas launched the first phase of the ethanol blended petrol (EBP) program that mandated blending of five percent ethanol in gasoline in nine states (out of a total of 29) and four union territories (UT) (out of a total of 6). The program was only implemented partially as ethanol was not consistently available from the sugar industry to the oil companies due to a decline in sugarcane/sugar production. Ethanol supplies available to oil companies came to a virtual halt by September 2004. The strong recovery in sugar and molasses production during Indian sugar marketing year (MY) 2005/06 (October/September) resulted in a renewed interest in the ethanol program. In August 2005, the government brokered an agreement between the sugar industry and petroleum companies to enable the purchase of ethanol, and the ethanol program restarted in a limited number of designated states and union territories.

Second Phase: With a strong resurgence in sugarcane/sugar production in MY 2006/07, the GOI announced the second phase of the EBP program in September 2006. The second phase of the EBP mandates that petroleum companies incorporate five percent blending of ethanol with petrol (gasoline) subject to commercial viability in 20 states and eight Union territories. Petroleum companies floated open tenders for ethanol from domestic producers, and after a series of time consuming negotiations subsequently agreed to buy ethanol for the

³ Mostly government or local community owned.

EBP program at Rs. 21.50 per liter⁴. However, the EBP program could not be implemented in many states due to high state taxes, excise duties, and levies, which makes the ethanol supply for blending commercially unviable. With lower than anticipated sugar production during MY 2007/08, and the consequent short supply of sugar molasses, there has been a slowdown in ethanol supplies for the EBP program in most states. With the significant increase in sugar molasses prices⁵, it is not possible to supply ethanol at the current negotiated prices.

Proposed Third Phase: The Government of India expressed interest in launching the third stage of the EBP from October 1, 2008, wherein (i) the ethanol blend ratio will be raised from 5 percent to ten percent, and (ii) 5 percent blending will be mandatory across the country. Given the short supply of sugarcane and sugar molasses during the upcoming MY 2008/09, it is unlikely the government will be able to implement the third phase of the EBP.

Alternate Feedstock: Efforts to produce ethanol from other feed stocks like sweet sorghum, sugar beet, sweet potatoes, etc. are at an experimental stage. The government also supports research for identifying sweet sorghum cultivars suitable for semi-arid wasteland that can be used for ethanol production. A few research organizations have also initiated research for the utilization of crop cellulose waste for the production of ethanol.

Government Incentives: There is no direct financial assistance or tax incentive for the production or marketing of ethanol or ethanol-blended petrol. However, the GOI offers subsidized loans (2 percent below market rate) from the government-held Sugarcane Development Fund for up to a maximum of 40 percent of the project cost to sugar mills for setting up an ethanol production unit. The government does support research and development on ethanol production undertaken by public and private sector organizations.

Bio-diesel Policy

National Mission on Bio-diesel: In April 2003, the GOI launched a National Mission on Bio-diesel that identified *Jatropha curcas* as the most suitable tree-borne oilseed for the production of bio-diesel⁶, and focused on promoting plantations of *Jatropha* on "wastelands". The GOI's Planning Commission set an ambitious target of 11.2-13.4 million hectares to be planted with *Jatropha* by 2012, in order to produce sufficient bio-diesel to blend at 20 percent with petro-diesel.

The Ministry of Rural Development was designated as the nodal ministry for the Mission that envisages a demonstration phase of targeting 400,000 hectares under *Jatropha* planting over a five-year period. The demonstration phase will involve identifying suitable *Jatropha* cultivars, developing nurseries and providing subsidized planting material to farmers in various agro-climatic regions. Several state governments and official entities have been proactive in the adoption of the bio-diesel program, but with varying degrees of success. Besides the state governments, Indian Railways has launched an ambitious *Jatropha* plantation project on railway land adjoining railway tracks. The demonstration phase will be followed by a self-sustaining expansion of *Jatropha* cultivation on 11.2-13.4 million hectares aimed at achieving the planning commission's bio-diesel production 20 percent blending target by 2012. Several government, international and private research organizations are

⁴ Exchange rate on June 11, 2008 - 1 US Dollars = 42.75 Indian Rupees

⁵ Prices have increased from Rs. 1,000 per ton in September 2007 to Rs. 2,500 per ton in May 2008.

⁶ *Jatropha Curcas* is a widely occurring species growing practically all over India under a variety of agro climatic conditions. The Planning Commission policy assumes that plantation can be taken up as a quick yielding plant even in adverse land situations viz. degraded and barren lands under forest and non-forest use, dry and drought prone areas, marginal lands, even on alkaline soils and as agro-forestry crops.

involved in research and development of *Jatropha* – collecting and identifying elite germplasm; evaluation trials for growth, seed yields and oil content; hybridization; developing location specific agronomic practices; and farmers training.

Bio-diesel Purchase Policy: In October 2005, the Ministry of Petroleum and Natural Gas announced a “bio-diesel purchase policy,” in which oil companies would purchase bio-diesel and blend it with high-speed diesel (HSD) at a five percent blending ratio. This would take place in 20 procurement centers spread across major producing areas in the country, effective January 2006. The bio-diesel will be procured at a pre-determined price (reviewed every six months by the ministry), which currently is Rs. 26.5 (65 U.S. cents) per liter. Market sources report that the cost of production of bio-diesel is 40 to 80 percent higher than this purchase price, resulting in no sales of bio-diesel at the centers. The government does not provide any direct financial assistance for the production of bio-diesel or for investment in plants and necessary facilities. Although the central government has exempted bio-diesel from the central excise tax (4 percent), most state governments do not provide any excise or sales tax exemptions for bio-diesel or bio-diesel blended diesel.

Ministries Involved in the Bio-fuels Sector

India has been pursuing a two-fold strategy for promotion of bio-fuels by: a) providing budgetary support for research, development and demonstration of technologies; and b) promoting private investment through fiscal incentives. Several ministries are involved in policymaking, regulation, promotion, and development of bio-fuels sector in India.

Ministry	Role
Ministry of New and Renewable Energy	Overall policymaking role for promoting development of bio-fuels. Also support research and technology development for production of bio-fuels.
Ministry of Petroleum and Natural Gas	Responsible for marketing bio-fuels as well as development and implementation of pricing and procurement policy
Ministry of Agriculture	Research and development for production of bio-fuel feedstock crops (sugarcane/sweet sorghum, etc for ethanol; and <i>Jatropha</i> and other non-edible oilseed species for bio-diesel)
Ministry of Rural Development	Responsible for promotion of <i>Jatropha</i> plantations in the wastelands
Ministry of Science and Technology	Supports research in bio-fuels crops, especially in the area of biotechnology

New Bio-fuel Policy Announcement Delayed

A draft National Bio-fuel Policy has been formulated by the Ministry of New and Renewable Energy. However, the government has delayed announcement of the proposed National Bio-fuel Policy due to growing concerns on rising food prices as any policy announcement supporting diversion of agricultural area for bio-fuel crops may further aggravate food price inflation.

The proposed Bio-fuel Policy, still in the draft stage, outlines the approach, strategy, targets, fiscal and financial incentives of various aspects of bio-fuel development, purchase policy,

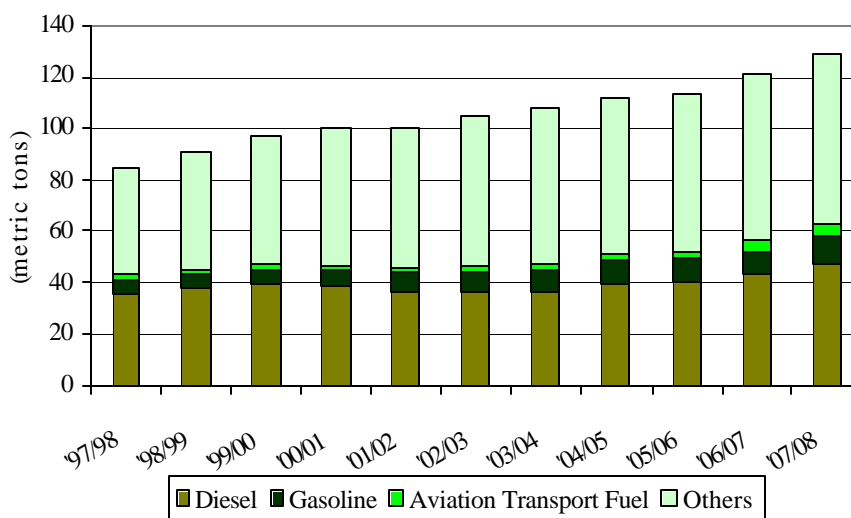
research & development (R&D), capacity building and legislation for encouraging the use of bio-fuels. The new policy seeks 10 percent blending of petrol and diesel with bio-fuels by 2012, and recommends minimum support prices for bio-fuel crops like *Jatropha* and other non-edible oilseeds. The new policy also proposes setting up a National Bio-fuel Development Board. The National Bio-fuel Policy would require approval by the parliament, which may take some time.

BIO-FUEL MARKET CONDITIONS

Motor Vehicle Petroleum Based Energy Market

India's petroleum-based energy demand by the transport sector is the fastest growing energy consuming sector, and will continue to grow steadily in the coming years due to strong growth in the economy, rise in income levels, and an increase in the availability and choice of vehicles. Energy demand by the transport sector is expected to grow by 6-8 percent per year during the 11th five-year plan (2007-2012). Petroleum product consumption is likely to rise from 113 million tons in Indian fiscal year (IFY) 2005/06 (April/March) to 135 million tons by the end of the 11th plan in 2011/12⁷.

Fig 2: India's Consumption of Petroleum Products
(Quantity in million metric tons)



Over 80 percent of passengers and about 60 percent of freight are transported by road in India. With the rise in incomes, there is increasing dependence on personal modes of transport such as cars and two wheelers. The latest available statistics⁸ indicate that the total number of vehicles has increased more than threefold, from 21.3 million (including 14.2 million 2-wheelers) in 1991 to 72.7 million (including 51.9 million 2-wheelers) in 2004. Industry sources report that the motor vehicle population grew by 12-15 percent in the last few years, and will continue to grow double digit in the next few years. Diesel and gasoline (petrol) contribute 98 percent of the energy consumed in the transport sector.

The current growth in transport activity is a significant environmental concern given the fact that India's carbon emissions are growing at an average of 3.2 percent per annum, making it one of the top five global contributors to carbon emissions. The GOI transport policy targets

⁷ Source: Petroleum Planning and Analysis Cell, Ministry of Petroleum and Natural Gas, GOI

⁸ Source: Ministry of Surface Transport, Government of India

Euro-III and Euro IV norms for the vehicles, which will require clean quality fuel, which can be achieved through adoption of bio-fuels.

Can India Meet Policy Targets?

Ethanol Policy

India has about 320 distilleries, with a production capacity of about 3.5 billion liters of rectified spirits (alcohol) per year, almost all of which is produced from sugar molasses⁹, and not from sugar juice, food grains or other cellulose feed stocks. The government's ethanol policy has led to over 115 distilleries modifying their plants to include ethanol production with a total ethanol production capacity of 1.5 billion liters per year. The current ethanol production capacity is enough to meet the estimated ethanol demand for the five percent blending ratio with gasoline. However, for a ten percent EBP program, current ethanol production capacities will need to be enhanced by expanding the number and capacities of molasses-based ethanol plants, and by setting up sugarcane juice-based ethanol production units.

Since sugarcane and sugar production is cyclical (see IN8034), availability of sugar molasses and sugarcane juice for ethanol production will vary depending on the sugarcane cycle. Lower sugar molasses availability and consequent higher molasses prices would affect the cost of production of ethanol, thereby causing disruptions in the supply of ethanol for the EBP program due to pre-negotiated fixed ethanol prices.

Table 1: India's Ethanol Requirement for 5 Percent Blending with Gasoline

Item	2007/08	2008/09
Molasses production (million tons)	11.97	10.26
Potential alcohol production ¹⁰ (Million Liters)	2,873	2,460
Demand for industrial use, potable alcohol, etc. (Million Liters)	1,515	1,550
Ethanol demand for 5 percent blend in gasoline for the country (figure in parentheses is demand at 10 percent blend) (Million Liters)	740 (1,480)	800 (1,600)
Total demand (Million Liters)	2,255 (2,995)	2,350 (3,150)
Surplus/Shortfall	618 (-122)	110 (-690)

Source¹¹: Industry sources.

Unless the government initiates sugarcane production stabilizing measures or the petroleum companies agree to link the ethanol prices with raw material prices, the EBP will be successful only during excess sugar production seasons. The third phase of the EBP will

⁹ There have been some experimental projects for production of alcohol from food grains coarse cereal), sugarcane juice and other cellulosic feedstock, but the production levels are negligible.

¹⁰ "Potential alcohol production" assumes all molasses is converted into alcohol, and there is no diversion for feed, other uses, and wastes. The average production of alcohol per ton of molasses is estimated at 240 liters.

¹¹ Official statistics on the production and distribution of molasses, alcohol, and ethanol are not available. This table was assembled from industry sources estimates.

require the sugar industry to install facilities for ethanol production directly from sugarcane juice.

Bio-diesel Policy

Due to the lack of availability of *Jatropha* seed and other non-edible oil feedstock, bio-diesel production in India has been negligible. The *Jatropha* plantations are at the very initial stage of development. The total *Jatropha* plantation area in the country is currently estimated at only around 400,000 hectares, of which about 70 percent are new plantations (1-3 year old) that are not yet into full production. There is growing concerns about the prospects of the *Jatropha* plantations based on the Planning Commission estimates¹² of the plantation density/seed yield/oil. Although *Jatropha* plants can survive in wastelands/degraded lands, fruiting and seed yield of the plant is highly dependent on availability of water (rain or irrigation) during critical stages. Consequently, there are insufficient *Jatropha* seeds to crush for bio-diesel production units for sale to petroleum companies for blending purposes. Although India's bio-diesel processing capacity is currently estimated at 100 to 150 thousand metric tons per annum, most bio-diesel units use mixed feed stocks (non-edible oilseeds, oil waste, fish oil, animal fast. etc) and are not operational during most of the year.

Industry sources expect the bio-diesel blending program to gather momentum in the next 4-5 years, with expected improved availability of *Jatropha* seeds as more areas are brought under plantation and as the plantations mature. Government and industry sources have been overly optimistic about *Jatropha* plantation prospects with estimates for expected area being projected from 7.0 million hectares to 11.2 million hectares. The new *Jatropha* plantations are expected to come into maturity in the next 3-4 years.

At best, India's non-edible oilseed *Jatropha* based biodiesel production policy is expected to be a partial success due to the following problems:

- Lack of good quality planting material and management practices leading to poor seed yields (vary from 1 to 2 kg per plant per annum),
- Lack of bank financing for *Jatropha* plantations, which is discouraging growers since the crop has a long gestation period compared to annual crops,
- Ownership issues with community or government-owned wastelands,
- Monoculture practices which raise environmental concerns about the impact on soil health and the water table.

Current Production Scenario

Ethanol Production

Due to lower than anticipated sugarcane production and consequent shortages of sugar molasses, ethanol for blending with petrol in Indian sugar marketing year 2007/08 (October/September) is estimated at 300 million liters against the target of 600 million liters. With the sugarcane and sugar production expected to slowdown further in the upcoming MY 2008/09, ethanol for fuel is forecast lower at 250 million liters unless petroleum companies agree for a major hike in the procurement price from the current negotiated price of Rs. 21.50 per liter.

¹² The Planning Commission estimates are based on *Jatropha* oil yield of 1.0 to 1.2 tons per hectare with the target parameters of 2500 plants per hectare (2mx2m); seed yield of 1.2-1.4 kg per plant; and oil realization of 35 percent from seeds. Recent field studies indicate optimal plant population of 1100 per hectare (3mx3m); avg. seed yield of 1.0 kg per plant; and avg. oil yield of 30 percent from the seeds; resulting in biodiesel yield of 330 kgs per hectare.

The progress of the second phase of the EBP has been slow as ethanol usage is subject to commercial viability. Due to a plethora of high taxes and levies, ethanol blending is commercially unviable in several states, particularly sugar/alcohol deficit states. Most states have a labyrinth of rules and regulations (inter-state movement, high excise duties, storage charges, etc.) to control alcohol for the potable liquor industry, and these regulations are equally applicable to ethanol for blending purposes.

Table 2: India's Production & Distribution of Molasses, Alcohol and Ethanol
(Sugar marketing Year (October/September))

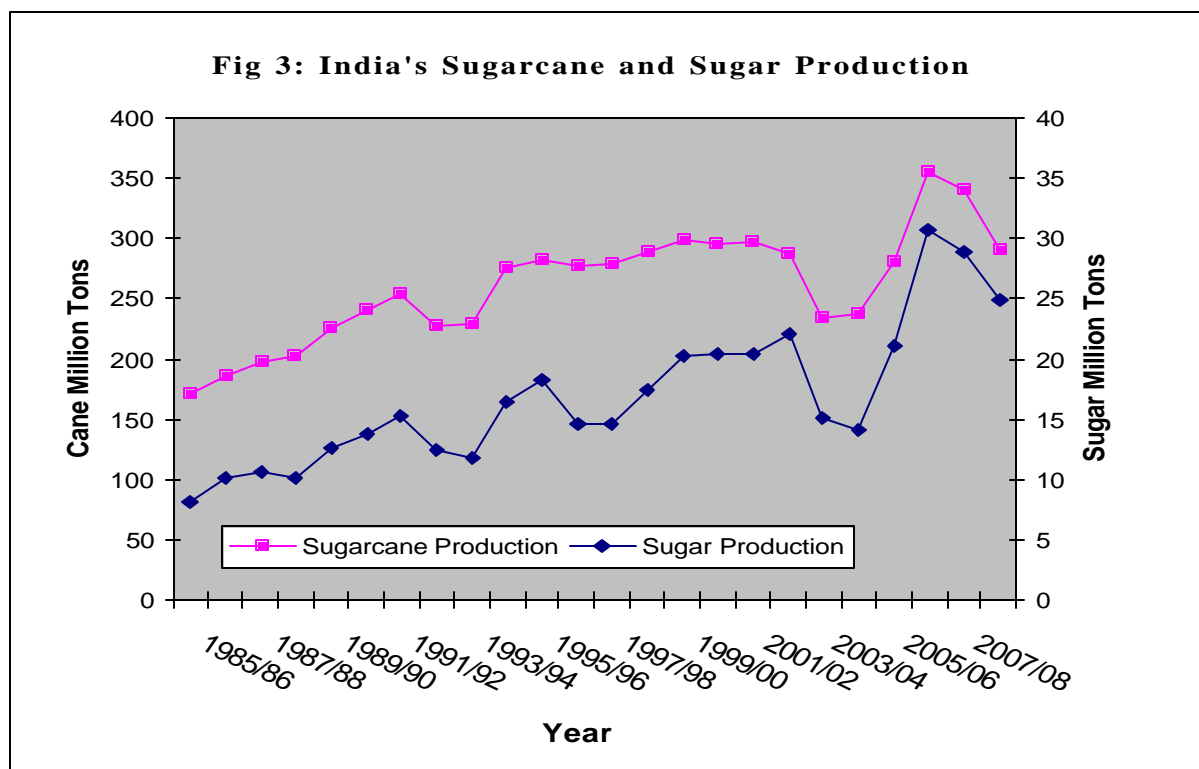
Item	2006/07	2007/08	2008/09 (F)
Total Molasses Production (million tons)	12.75	11.97	10.26
<u>Molasses for:</u>			
Alcohol Production (million tons)	9.17	8.57	6.76
Other Use (feed, other uses & waste) (million tons)	3.58	3.40	3.50
Total Alcohol Production (million liters)	2,200	2,050	1,650
Opening Stocks (million liters)	730	1,210	1,420
Imports (million liters)	0	0	0
<u>Alcohol for:</u>			
Industrial Use (million liters)	635	660	700
Potable Liquor (million liters)	750	790	850
Ethanol for Blended Gasoline (million liters)	250	300	250
Other Use (million liters)	85	90	95
Carryover Stocks of Alcohol (million liters)	1,210	1,420	1,175

Source: FAS/New Delhi estimates based on information from Industry sources.

The GOI is actively engaged in working with state governments to resolve the underlying issues constraining adoption of the EBP program in other states. However, the current shortage in supplies of ethanol has been due to high prices of sugar molasses that makes it unviable to supply ethanol to petroleum companies at the negotiated prices¹³. The sugar industry is expected to pressure the government to ask the petroleum companies to raise the negotiated price. Historically, petroleum companies have opposed increases in ethanol prices, but given the significant jump in the crude prices, they may be induced to revise the prices higher. Nevertheless, the short supply of sugar molasses will constrain the ethanol supply for the EBP program during the MY 2008/09.

¹³ Petroleum companies have agreed to buy fuel grade ethanol from sugar companies at Rs. 21.50 per liter. The cost of production of ethanol depends on the price of molasses, which has increased more than two fold since the beginning of MY 2007/08. Consequently, sugar companies who had tendered for supply of ethanol to the petroleum companies are no longer able to supply at the negotiated prices.

Sugarcane and sugar production in India typically follows a 6 to 8 year cycle, wherein 3 to 4 years of higher production are followed by 2 to 3 years of lower production.



The Indian sugar industry crushes about 70-80 percent of the sugarcane for sugar production, with the remaining cane used for local sweeteners (*khandsari* and *gur*), seed, feed and cane juice, chewing and waste. The byproduct of the sugar industry, sugar molasses is used for production of alcohol (including ethanol), animal feed and other minor usage. In years of bumper sugarcane production, the sugar industry may prefer to produce ethanol directly from sugarcane juice to avoid the sugar market glut and declining prices. There is considerable scope for increasing sugarcane yields from the existing acreage, which can also offer additional sugarcane for production of ethanol directly from juice. There is limited scope to increase area under sugarcane as the crop is water intensive and India's irrigation water supplies are increasingly limited.

Since the production of ethanol directly from sugarcane juice requires additional investments for technological modifications, most mills are closely assessing the market demand for ethanol and the efficacy of the government's ethanol policy before making the necessary investments. Reports suggest that two sugar mills have tried production of ethanol from sugarcane juice on an experimental basis, but are not yet starting commercial production. There are currently no foreign players in the Indian sugar (and associated distillery) industry, as it is one of the most controlled agribusiness-sectors in the country (see policy section of Sugar Annual IN7035). However, the increased consumption of ethanol by oil companies, and the production of ethanol from sugarcane juice by local companies may attract foreign investment in the future.

Bio-Diesel Production

India's commercial production of bio-diesel is very small, mostly for sale in the unorganized sector or for experimental projects. Due to high edible oil prices in the domestic market¹⁴, it is not economically feasible to produce bio-diesel from vegetable oils. The small quantities of *Jatropha* and other non-edible oilseeds procured by traders are mostly crushed for oil, which is used for lighting lamps and other non-edible uses.

A few entrepreneurs have established small plants (less than one ton per day) to extract bio-diesel, but the product is mostly sold in the unorganized sector, mainly for operating irrigation pumps and other agricultural uses. There are about 17-18 large capacity plants (one to fifty tons per day) that produce bio-diesel from edible oil waste (unusable oil fractions), animal fat and non-edible oil. Automobile and transport companies mostly buy their bio-diesel for R&D trials on their vehicles. Indian Railways and other state-owned transport companies have set up experimental projects for bio-diesel production. Reliable production information on Indian bio-diesel is not available as commercial production is yet to take off in an organized manner, and a rough estimate can range anywhere between 1,000 to 2,500 tons per year.

Small and scattered *Jatropha* plantations at a large distance from bio-diesel producing units, and lack of efficient marketing channels result in high inefficiencies leading to high production costs. Industry sources estimate current bio-diesel production costs at anywhere between Rs. 32 to 45 (76 cents to \$1.1) per liter, much above the government advised purchase price (Rs. 26.5 per liter). Consequently, there has been no commercial sale of bio-diesel at the GOI's bio-diesel purchase centers. The small quantities of bio-diesel produced by the local units sold to automobile companies range between Rs. 50 to 60 per liter for experimental trials of their vehicles.

Many Indian corporations are venturing into bio-diesel production by initiating a memorandum of understanding with state governments to establish *Jatropha* plantations on government wasteland or contract farming with small and medium farmers. Several state governments have announced policies to encourage *Jatropha* cultivation, setting up bio-diesel plants and supply chains in their respective states.

Although the nascent bio-diesel industry has been lobbying the government to allow duty concessions on imports of vegetable oils (palm, soybean, etc.) and their derivatives for captive consumption for bio-fuel production at their units, there are no positive indications for approval of such proposals. However, a few local and foreign collaborative projects for production of bio-diesel for exports are being set up near the ports as export oriented units¹⁵ that could boost the country's bio-diesel production capacity to 1.0 to 2.0 million tons per annum in next few years.

Except for some experimental trials by research organizations, there is no commercial production of bio-fuels from other biomass.

¹⁴ Spot prices of various vegetable oil in Mumbai on June 6, 2008 – RBD Palmolein Rs. 64.2 per kg; Refined Cottonseed Oil Rs. 62.0 per kg; Refined Soyoil Rs. 64.2 per kg; Rapeseed Oil Rs. 67.0 per kg; and Peanut Oil Rs. 67.0 per kg. Thus vegetable oil prices ranged between Rs. 55.8 to Rs. 67.8 per liter against the government's bio-diesel price of Rs. 26.5 per liter.

¹⁵ Sources report that 2-3 large export oriented bio-diesel units are being set up near ports, wherein they will use imported feedstock (like crude degummed edible oils or oil waste) at zero duty for exports of bio-diesel to the United States and E.U.

Bio-fuel Import Regime

Although there are no quantitative or SPS restrictions on imports of bio-fuels, high duties on tariff lines associated with bio-fuels (see below) appear to make imports economically unviable. Given that the GOI's focus is on developing domestic bio-fuel production capabilities, there are no duty concessions for imports of bio-fuels or imports of feedstock (maize, oilseed, and vegetable oils such as palm oil etc) for production of bio-fuels for the domestic market. Although some oil companies are pushing for imports of ethanol/bio-diesel at a concessional duty for blending with petrol/diesel, it is highly unlikely to receive government approval. However, current trade regulations allows duty free imports of bio-fuel feed stocks for re-export by certified export oriented units. The GOI does not provide any financial assistance for exports of biofuels, both ethanol and biodiesel.

Table 4: India's existing import duty on tariff lines associated with bio-fuels

ITC HS Tariff Number	Total Import Duty (Percent ad valorem on CIF value)
2207.10 Ethanol denatured	164.68
2207.20 Ethanol undenatured	56.22
3824.90 Chemical products not elsewhere specified	28.64

Bio-fuel Trade

India has not imported nor exported ethanol or other bio-fuels for fuel purposes. Market sources report that one of the recently commissioned bio-diesel export oriented units is the process of negotiation for exports of bio-diesel to the E.U. and the United States. During years of low sugar production (MY 2003/2004 and MY 2004/2005), and the consequent molasses and alcohol shortages, India imported some alcohol, mainly for industrial use and potable liquor production.

IMPACT OF BIOFUEL FEEDSTOCK ON FOOD/FEED/TRADE

India does not produce any ethanol from cereal grains (maize, etc.), and thus, there has been no impact of the ethanol program on the domestic market for food, feed and trade of cereal grains and byproducts. Similarly, as the bio-diesel program is based on the use of non-edible vegetable oil, bio-diesel production should not have an impact on feed, food, and trade of oilseeds, vegetable oils and other edible products.

Since production of ethanol for fuel purposes is basically from sugar molasses, it has not had any impact on production and trade of sugar for food and industrial use. Due to the recent bumper production of sugarcane/sugar, and consequently sugar molasses, fuel ethanol production has not impacted availability of molasses for feed and alcohol for other uses (industrial, potable liquor, etc.). If ethanol prices are allowed to be linked to sugar molasses prices, it may impact the availability of sugar molasses for use in cattle feed, and the use of alcohol for industrial and potable liquor. When Stage III of the EBP program is implemented, it may also impact availability of sugar molasses for alternative uses.

BIO-ENERGY USE IN OTHER AREAS

Biomass-based fuels support over 80 percent of home energy use (mostly for cooking and heating) in India, and consist of agricultural byproducts (crop residues, cow dung, etc.) and gathered fuel wood. Biomass is also used as industrial fuel by small and cottage industries in

the organized sector. Total biomass energy in the household sector and unorganized sector accounts for almost one-third of India's total primary energy consumption needs (540 to 550 million tons oil equivalent in 2006/07)¹⁶.

India launched a National Project on Biogas Development in 1981-82 with the objective of utilizing cattle manure and human waste for fuel for rural households along with manure for agricultural fields¹⁷. Currently, there are about 3.9 million family type biogas plants, against an estimated target of 12 million biogas plants in the country. However, evaluation studies show that only about half of the installed plants are operational.

Biomass resources like crop residues, agro-industrial waste, fuel wood, etc., are also used for generation of electricity through biomass gasification. Some industries (sugar, paper pulp, rice mills, etc) are using the industrial waste for cogeneration of electricity and heat energy to meet their total/partial requirement, and/or sale of excess power to distribution grids. Industrial co-generation did not receive much attention in the past as cheap electricity and fuel were abundantly available. With the increasing electricity cost and unreliable supply of electricity from the public distribution grids, several industries are increasingly getting into co-generation. Currently, most of the cogeneration activity is sugarcane bagasse based¹⁸. However, there is significant potential in breweries, distilleries, rice mills, textile mills, fertilizer plants, etc. for undertaking cogeneration.

The GOI has initiated several programs for promoting renewable energy sources including biomass based energy sources, details of which can be accessed from their website <http://mnes.nic.in/frame.htm?majorprog.htm>

Table 5: India's Biomass-based Commercial Energy Potential/Achievement

S No:	Source/System	Estimated Potential	Achievement (By March 2007)
1	Bio Power (Agric Residues & Plantations)	16,000 MW	605.8 MW/1
2	Sugarcane bagasse based Cogeneration	3,500 MW	719.8 MW
3	Non-bagasse based biomass co-generation/2	-	95.0 MW
4	Biomass Gasifier	-	86.4 MW
5	Energy Recovery from Waste	2,700	78.9 MW
6	Family Type Biogas Plants	12 million	3.9 million

Notes: /1 – Megawatt

/2 – Cogeneration by other agro-industries like rice mills, pulp, etc.

Source: Ministry of New and Renewable Energy, GOI.

¹⁶ Source: Planning Commission (GOI) report on "Integrated Energy Policy", August 2006.

¹⁷ Biogas has 50 to 70 percent methane gas that is used for cooking and lighting purpose.

¹⁸ Bagasse – crop waste after crushing of the sugarcane.